IN THE CLAIMS

Please amend the following Claim as indicated.

1. (Currently amended) An auto-calibrating spectrometer comprising:

a light source;

a reference sample having known reflection;

a first detector for outputting electrical signals corresponding to light signals that are detected thereby;

an first optical element that transmits light toward the reference sample and that reflects a small amount of light;

~~a detector for outputting electrical signals corresponding to light signals that are detected thereby;~~

optical coupling apparatus that couples light from the light source to the first optical element and couples light reflected from the first optical element and light reflected from the reference sample ~~a sample under measurement, and~~ to the first detector;

a shutter assembly that selectively couples light or inhibits light transmitted by the first optical element to from impinging upon and being reflected by ~~a~~ the reference sample ~~having known reflection or the sample under measurement~~; and

a controller coupled to the first detector that processes the electrical signals output thereby corresponding to levels of light derived from the first optical element and the reference sample and implements an algorithm that calculates a calibration value for the spectrometer at each wavelength of light output by the light source using a predetermined equation to autocalibrate the spectrometer.

2. (Currently amended) The spectrometer recited in Claim 1 wherein the optical coupling apparatus comprises a fiber optic cable that couples light from the light source to the first optical element, and which comprises at least one illumination fiber for coupling light to the sample under measurement, and a detector fiber that collects light reflected from the first optical element and directs it to the first detector.

3. (Currently amended) The spectrometer recited in Claim 1 wherein the optical coupling apparatus comprises one or more lenses and a beam splitter that cooperate to couple light from the light source to the first optical element and sample under measurement, and to the first detector.

4. (Original) The spectrometer recited in Claim 1 wherein the light source comprises a polychromatic light source.

5. (Original) The spectrometer recited in Claim 1 wherein the light source comprises a monochromatic light source.

6. (Previously amended) The spectrometer recited in Claim 1 further comprising a second shutter assembly disposed between the optical coupling apparatus and the sample under measurement.

7. (Currently amended) The spectrometer recited in Claim 1 wherein the first optical element not anti-reflection coated.

8. (Previously amended) The spectrometer recited in Claim 2 wherein the fiber optic cable comprises a plurality of outer illumination fibers that surround a single detector fiber.

9. (Previously amended) The spectrometer recited in Claim 2 wherein the light source comprises a polychromatic light source, and which further comprises a fixed grating disposed between the fiber optic cable and the first detector that chromatically separates the light so that each pixel receives light of a distinct narrow range of wavelengths.

10. (Currently amended) The spectrometer recited in Claim 6 wherein the predetermined equation is:

$$\text{Reflection} = I_i*((S_i\text{-}B2_i)\text{-}(B1_i\text{-}B3_i)/((R_i\text{-}B2_i)\text{-}(B1_i\text{-}B3_i)),$$

where, S_i is the signal strength at wavelength i for the sample under measurement, R_i is the signal strength at wavelength i for a reference sample of known reflection, $B1_i$ is the background signal strength at wavelength i with the light source on and with reflection only from a first focusing lens comprising the first optical element, $B2_i$ is the background signal strength at wavelength i with the light source off and the second shutter assembly open, $B3_i$ is the background signal strength at wavelength i with the light source off and the second shutter assembly closed, and I_i is the known reflection at wavelength i of the reference sample

11. (Currently amended) The spectrometer recited in Claim 10 wherein ~~R1~~ Ri is computed using the equation:

$$Ri = Ri(0)*(B1_i\text{-}B3_i)/(B1_i(0)\text{-}B3_i(0))$$

where, $R_i(0)$ is the signal strength at wavelength i for the reference sample of known reflection at initial calibration, $B1_i$ is the current background signal strength at wavelength i with the light source off and the second shutter assembly closed, $B1_i$ (0) is the background signal strength at wavelength i with the light source on and the second shutter assembly closed at the time of initial calibration, $B3_i$ is the current background signal strength at wavelength i with the light

source off and the second shutter assembly closed, and $B3_{i(0)}$ is the background signal strength at wavelength i with the light source off and the second shutter assembly closed at the time of initial calibration.

12. (Currently amended) The spectrometer recited in Claim 6 further comprising:

a second ~~focusing lens~~ optical element for receiving light that is transmitted by or reflected off of the sample under measurement toward it;

a second detector coupled to the controller; and

a second fiber optic cable for coupling light received by the second ~~focusing lens~~ optical element to the second detector;

and wherein the controller processes the electrical signals output by the respective detectors and implements an algorithm that calculates a calibration value for the spectrometer at each wavelength of light output by the light source using a second predetermined equation to autocalibrate the spectrometer.

13. (Original) The spectrometer recited in Claim 12 wherein the second predetermined equation comprises:

$$\text{Transmission} = I_i*((S_i-B2_i)-(B1_i-B3_i)/((T_i-B2_i)-(B1_i-B3_i))$$

where, S_i is the signal strength at wavelength i for the unknown sample, T_i is the signal strength of the first detector at wavelength i for a reference sample of known transmission, $B1_i$ is the background signal strength of the first detector at wavelength i with the light source on and the second shutter assembly closed, $B2_i$ is the background signal strength of the first detector at wavelength i with the light source off and the second shutter assembly open, $B3_i$ is the background signal strength of the first detector at wavelength i with the light source off and the second shutter assembly closed, and I_i is the known transmission at wavelength i of the reference sample.

14. (Currently amended) The spectrometer recited in Claim 13 wherein ~~T1~~ Ti is computed using the equation:

$$Ti = Ti(0)* (B1_{i2}-B3_{i2})/(B1_{i2}(0)-B3_{i2}(0))$$

where, $T_i(0)$ is the signal strength of the first detector at wavelength i for the reference sample at initial calibration, $B1_{i2}$ is the current background signal strength of the second detector at wavelength i with the light source is on and second shutter assembly is closed, $B1_{i2}0)$ is the background signal strength of the second detector at wavelength i with the light source on and the second shutter assembly closed at the time of initial calibration, $B3_{i2}$ is the current background signal strength of the second detector at wavelength i with the light source off and

the second shutter assembly closed, and $B3_{i2(0)}$ is the background signal strength of the second detector with the light source off and the second shutter assembly closed at the time of initial calibration.

15. (Previously amended) An auto-calibrating method for use with a spectrometer comprising a light source, an optical element, a detector for outputting electrical signals corresponding to detected light signals, optical coupling apparatus that couples light from the light source to the optical element, and couples light reflected from the optical element and a sample under measurement to the detector, a shutter assembly that selectively couples light or inhibits light from impinging upon and reflected by a reference sample having known reflection or the sample under measurement, and a controller coupled to the detector that processes the electrical signals output thereby and implements the method to calculate a reflection value for the spectrometer at each wavelength of light output by the light source to autocalibrate the spectrometer, the method comprising the steps of:

performing an initial calibration of the spectrometer;

performing a background scan with the light source on and the shutter assembly closed;

performing a background scan, if required, with the light source off and the shutter assembly open;

performing a background scan with the light source off and the shutter assembly closed; and

performing a sample scan of the sample under measurement with the light source on and the shutter assembly open.

16. (Previously amended) The method recited in Claim 15 wherein the initial calibration step comprises the steps of:

performing a background scan with the light source on and the shutter assembly closed;

performing a background scan with the light source off and the shutter assembly open;

performing a background scan with the light source off and the shutter assembly closed; and

performing a reference scan of a sample of known reflection with the light source on and the shutter assembly open.

17. (Previously amended) An auto-calibrating method for use with a spectrometer comprising a light source, an optical element, first and second detectors for outputting electrical signals corresponding to detected light signals, a shutter assembly that selectively couples light or inhibits light from impinging upon and reflected by a reference sample having known reflection or the sample under measurement, optical coupling apparatus for coupling light from the light source to the optical element, and coupling light reflected from the optical element and a sample under measurement to the first detector, and for coupling light that is transmitted by or

reflected off of the sample under measurement to the second detector, and a controller coupled to the first and second detectors that processes the electrical signals output thereby and implements the method to calculate a transmission value for the spectrometer at each wavelength of light output by the light source to autocalibrate the spectrometer, the method comprising the steps of:

performing an initial calibration of the spectrometer;

performing a background scan of the first and second detectors with the light source on and the shutter assembly closed;

performing a background scan, if required, of the first and second detectors with the light source off and the shutter assembly open;

performing a background scan, if required, of the first and second detectors with the light source off and the shutter assembly closed; and

performing a sample scan using the first detector of an unknown sample with the light source on and *the* shutter assembly open.

18. (Previously amended) The method recited in Claim 17 wherein the initial calibration step comprises the steps of:

performing a background scan of the first and second detectors with the light source on and the shutter assembly closed;

performing a background scan of both detectors with the light source off and the shutter assembly open

performing a background scan of both detectors with the light source off and the shutter assembly closed; and

performing a reference scan using the first detector of a sample of known transmission with that light source on and the shutter assembly open.